

In The Claims

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (Cancelled).

Claim 2. (Currently Amended) ~~A~~ The robotic cart pulling vehicle of claim 1 comprising:

at least two axially collinear drive wheels;

a robot body mounted on said drive wheels;

a control system on the robot body utilizing, at least in part, a ded-reckoning navigational system;

a cart attaching mechanism on said robot body for coupling a cart to said robotic vehicle; and

a positioning error reducing system for reducing accumulated error in the ded-reckoning navigational system, said positioning error reducing system including at least a wherein the positioning error reducing system includes the calibration system having

at least one proximity sensor mounted on the robot body, said control system coupled to said at least one proximity sensor for adjusting a ~~the~~ calculated robotic position, wherein the control system sets up virtual checkpoints along known fixed features of a predetermined length, takes a statistically significant number of proximity readings along an adjacent fixed feature, removes statistically anomalous readings and automatically adjusts the calculated robotic position based upon statistically significant readings.

Claim 3. (Original) The robotic cart pulling vehicle of claim 2 wherein each said proximity sensor is an infrared range sensor.

Claim 4. (Original) The robotic cart pulling vehicle of claim 2 wherein at least one fixed feature is a straight wall section of at least 2' in length.

Claim 5. (Original) The robotic cart pulling vehicle of claim 2 wherein each said fixed feature is a straight wall section of at least the predetermined length.

Claim 6. (Currently Amended) The robotic cart pulling vehicle of claim 2 wherein said statistically significant number of proximity readings taken along an adjacent fixed

feature are obtained by the control system at a rate of about 16 times a second as the robotic vehicle moves along the adjacent fixed feature.

Claim 7. (Currently Amended) The robotic cart pulling vehicle of claim 2 wherein the positioning error reducing system includes a load transfer point of the cart attaching mechanism, that is in a the form of a load transfer ring positioned at a height from a the supporting surface of the robotic cart pulling vehicle ground that is below a height that is selected from at least one of

- (a) approximately (1/5) of a the length of the wheel base of said drive wheels, and
- (b) a height of the axles of the drive wheels.

Claim 8. (Currently Amended) The robotic cart pulling vehicle of claim 7 wherein the load transfer ring is positioned at a height below a height that is approximately (1/10) of the length of the wheel base.

Claim 9. (Original) The robotic cart pulling vehicle of claim 7 wherein the load transfer ring is positioned at a height below the axles of the drive wheels.

Claim 10. (Currently Amended) The robotic cart pulling vehicle of claim 7 wherein

the positioning error reducing system includes a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

- (a) ~~under load~~, compression of the wheel in operation which is less than 2% of the wheel radius of the wheel under no load, and
- (b) the width of the annular contact surface is less than 1.5% of the length of the wheelbase.

Claim 11. (Currently Amended) The robotic cart pulling vehicle of claim 10 wherein the positioning error reducing system includes a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

- (a) ~~under load~~, compression of the wheel in operation which is less than 1% of the wheel radius of the wheel under no load, and
- (b) the width of the annular contact surface is less than 1.0% of the length of the wheelbase.

Claim 12. (Currently Amended) The robotic cart pulling vehicle of claim 10 wherein the positioning error reducing system includes a floor variation compliance structure, wherein the cart attaching mechanism includes a cart attaching bore in the robot body

and a cart attaching post within the cart attaching bore, wherein each said drive wheel is mounted to said robot body in a manner allowing vertical movement of said wheel relative to the cart attaching post in the amount of at least three degrees measured from a center point between of the collinear drive wheels along axles of the collinear drive wheels, whereby said collinear drive wheels maintain a substantially even distribution of load over minor surface variations.

Claim 13. (Currently Amended) The robotic cart pulling vehicle of claim 2 wherein the positioning error reducing system includes a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

- (a) under load, compression of the wheel in operation is less than 1% of the wheel radius of the wheel under no load, and
- (b) the width of the annular contact surface is less than 1.0% of the length of the wheelbase.

Claim 14. (Currently Amended) The robotic cart pulling vehicle of claim 2 wherein the positioning error reducing system includes a floor variation compliance structure, wherein the cart attaching mechanism includes a cart attaching bore in the robot body and a cart attaching post within the cart attaching bore, wherein each said drive wheel is mounted to said robot body in a manner allowing vertical movement of said wheel

relative to the cart attaching post in the amount of at least three degrees measured from a center point between ~~of~~ the collinear drive wheels along axles of the collinear drive wheels, whereby said collinear drive wheels maintain a substantially even distribution of load over minor surface variations.

Claim 15. (Currently Amended) ~~A~~ ~~The~~ robotic cart pulling vehicle ~~of claim 1~~ comprising:

at least two axially collinear drive wheels;

a robot body mounted on said drive wheels;

a control system on the robot body utilizing, at least in part, a ded-reckoning navigational system;

a cart attaching mechanism on said robot body for coupling a cart to said robotic vehicle; and

a positioning error reducing system for reducing accumulated error in the ded-reckoning navigational system, said positioning error reducing system including at least a ~~wherein the positioning error reducing system includes~~ a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

- (a) ~~under load~~, compression of the wheel in operation is less than 2% of the wheel radius of the wheel under no load,
- (b) the width of the annular contact surface is less than 1.5% of the length of the wheelbase, and
- (c) the width of the annular contact surface patch is on the order of 0.20".

Claim 16. (Currently Amended) The robotic cart pulling vehicle of claim 15 wherein the positioning error reducing system includes a floor variation compliance structure, wherein the cart attaching mechanism includes a cart attaching bore in the robot body and a cart attaching post within the cart attaching bore, wherein each said drive wheel is mounted to said robot body in a manner allowing vertical movement of said wheel relative to the cart attaching post in the amount of at least three degrees measured from a center point between of the collinear drive wheels along axles of the collinear drive wheels, whereby said collinear drive wheels maintain a substantially even distribution of load over minor surface variations.

Claim 17. (Currently Amended) The robotic cart pulling vehicle of claim 15 wherein the positioning error reducing system includes a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

(a) ~~under load~~ compression of the wheel in operation is less than 1% of the wheel radius of the wheel under no load, and

(b) the width of the annular contact surface is less than 1.0% of the length of the wheelbase.

Claim 18. (Currently Amended) ~~A~~ The robotic cart pulling vehicle ~~of claim 1~~ comprising:

at least two axially collinear drive wheels;

a robot body mounted on said drive wheels;

a control system on the robot body utilizing, at least in part, a ded-reckoning navigational system;

a cart attaching mechanism on said robot body for coupling a cart to said robotic vehicle; and

a positioning error reducing system for reducing accumulated error in the ded-reckoning navigational system, said positioning error reducing system including at least a ~~wherein the positioning error reducing system includes~~ a minimal wheel contact surface structure, wherein each said drive wheel includes an annular contact surface formed as a coating over a solid, stiff core and includes at least one of

(a) ~~under load~~ compression of the wheel in operation is less than 1 % of the wheel radius of the wheel under no load, and

(b) the width of the annular contact surface is less than 1.0% of the length of the wheelbase.

Claim 19. (Currently Amended) The robotic cart pulling vehicle of claim 18 4 wherein the cart attaching mechanism includes a cart attaching bore in the robot body and a cart attaching post within the cart attaching bore, wherein the cart attaching post provides both a mechanical and an electrical connection between the cart and the robot vehicle.

Claim 20. (Currently Amended) A The robotic cart pulling vehicle of ~~claim 1~~ comprising:

at least two axially collinear drive wheels;

a robot body mounted on said drive wheels;

a control system on the robot body utilizing, at least in part, a ded-reckoning navigational system;

a cart attaching mechanism on said robot body for coupling a cart to said robotic vehicle; and

a positioning error reducing system for reducing accumulated error in the ded-
reckoning navigational system, said positioning error reducing system including at least
a wherein the positioning error reducing system includes a floor variation compliance
structure, wherein the cart attaching mechanism includes a cart attaching bore in the
robot body and a cart attaching post within the cart attaching bore, wherein each said
drive wheel is mounted to said robot body in a manner allowing vertical movement of
said wheel relative to the cart attaching pole in the amount of at least three degrees
measured from a center point between of the collinear drive wheels along axles of the
collinear drive wheels, whereby said collinear drive wheels maintain a substantially
even distribution of load over minor surface variations.